

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Appl. No. : 10/538,900 Confirmation No.: 6056  
Appellants : Milner et al.  
Filed : June 14, 2005  
For : Polymerization Process  
TC/Art Unit : 1796  
Examiner : Rabago, Robert  
Docket No. : 2003B133A

**APPELLANTS' BRIEF UNDER 37 CFR 41.37**

Mail Stop Appeal Brief-Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Appellants appeal to the honorable Board of Patent Appeals and Interferences the Final rejection of the claims set forth in the Office Action mailed April 29, 2009.

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**I. REAL PARTY IN INTEREST**

The real party in interest is ExxonMobil Chemical Patents Inc., the assignee of the present application.

**II. RELATED APPEALS AND INTERFERENCES**

Appellants, Appellants' counsel, and the assignee of the application are not aware of any other appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**III. STATUS OF CLAIMS**

Claims 8, 19, 52, and 54-59 are cancelled.

Claims 1-7, 9-18, 20-30, 32-33, 35-40, 48-50, 53, and 59 are rejected.

Claims 34, 41-47, and 51 appear to stand objected to as being based on a rejected base claim.

Claim 31 is allowed.

Claims 1-7, 9-18, 20-30, 32-33, 35-40, 48-50, 53, and 59 are appealed.

**IV. STATUS OF AMENDMENTS**

The Response under C.F.R. § 1.116, filed 29 July 2009, contained no amendments to the claims and was entered into the record.

## **V. SUMMARY OF CLAIMED SUBJECT MATTER**

### **Claim 1 – First independent claim**

Claim 1 is directed to a polymerization process wherein one or more monomers are polymerized (para [0016], lines 1-2 of para [0051]). The one or more monomer is independently selected from the group consisting of olefins, alpha-olefins, disubstituted olefins, isoolefins, conjugated dienes, non-conjugated dienes, styrenics, substituted styrenics, and vinyl ethers (lines 2-5 of para [0051]). The one or more monomer is contacted with one or more Lewis acid(s) (para [0016]) and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) (paragraphs [0016], [0046], [00122]) in a reactor. The diluent comprises from 15 to 100 volume % HFC based upon the total volume of diluent (lines 1-4 of para [00132]). The temperature of the polymerization is less than 0°C (lines 6-7 of paragraph [00146]) and the pressure is from above 0 to 14,000 kPa (line 1 of paragraph [00148]). The one or more Lewis acid(s) is represented by the formula  $MR_nX_{3-n}$  (lines 1-2 of paragraph [0065]) wherein M is a Group 13 metal, each R is a monovalent C<sub>1</sub> to C<sub>12</sub> hydrocarbon radical independently selected from the group consisting of an alkyl, aryl, arylalkyl, alkylaryl and cycloalkyl radicals, n is an integer from 1 to 3, and each X is a halogen (lines 1-6 of paragraph [0065]).

### **Claim 22 – Second independent claim**

Claim 22 is directed to a polymerization process wherein one or more monomers are polymerized (para [0016], lines 1-2 of para [0051]). The one or more monomer is contacted with one or more Lewis acid(s) (para [0016]) and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) (paragraphs [0016], [0046], [00122]) in a reactor. The diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent (lines 1-2 of para [00132]). The temperature of the polymerization is less than 0°C (lines 6-7 of paragraph [00146]) and the pressure is from above 0 to 14,000 kPa (line 1 of paragraph [00148]). The one or more Lewis acid(s) is represented by the formula  $MX_y$  (line 1 of para [0068]) wherein M is a Group 15 metal, each X is a halogen, and y is 3, 4 or 5 (lines 1-4 of para [0068]).

Claim 23 – Third independent claim

Claim 23 is directed to a polymerization process wherein one or more monomers are polymerized (para [0016], lines 1-2 of para [0051]). The one or more monomer is contacted with one or more Lewis acid(s) (para [0016]) and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) (paragraphs [0016], [0046], [00122]) in a reactor. The diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent (lines 1-2 of para [00132]). The temperature of the polymerization is less than 0°C (lines 6-7 of paragraph [00146]) and the pressure is from above 0 to 14,000 kPa (line 1 of paragraph [00148]). The one or more Lewis acid(s) is represented by the formula  $MR_nX_{y-n}$  (lines 1-2 of para [0069]) wherein M is a Group 15 metal (line 2 of para [0069]), each R is a monovalent C<sub>1</sub> to C<sub>12</sub> hydrocarbon radical independently selected from the group consisting of an alkyl, aryl, arylalkyl, alkylaryl and cycloalkyl radicals (lines 2-4 of para [0069]), n is an integer from 0 to 4 (lines 4-5 of para [0069]), y is 3, 4 or 5, wherein n is less than y (line 4 of para [0069]), and each X is a halogen (line 5 of para [0069]).

Claim 24 – Fourth independent claim

Claim 24 is directed to a polymerization process wherein one or more monomers are polymerized (para [0016], lines 1-2 of para [0051]). The one or more monomer is contacted with one or more Lewis acid(s) (para [0016]) and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) (paragraphs [0016], [0046], [00122]) in a reactor. The diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent (lines 1-2 of para [00132]). The temperature of the polymerization is less than 0°C (lines 6-7 of paragraph [00146]) and the pressure is from above 0 to 14,000 kPa (line 1 of paragraph [00148]). The one or more Lewis acid(s) is represented by the formula  $M(RO)_nR'_mX_{y-(m+n)}$  (lines 1-2 of para [0070]), wherein M is a Group 15 metal (line 2 of para [0070]), each RO is a monovalent C<sub>1</sub> to C<sub>30</sub> hydrocarboxy radical independently selected from the group consisting of an alkoxy, aryloxy, arylalkoxy, alkylaryloxy radicals (lines 2-4 of para [0070]), each R' is a monovalent C<sub>1</sub> to C<sub>12</sub> hydrocarbon radical independently selected from the group consisting of an alkyl, aryl, arylalkyl, alkylaryl and cycloalkyl radicals (lines 4-6 of para [0070]), n is an integer from 0 to 4 (line 6-7 of para [0070]), m is an integer from 0 to 4 (line 7 of para [0070]), y is 3, 4 or 5, wherein the sum of n and m is less than y (line 7-8 of para [0070]), and each X is a halogen (line 8 of para [0070]).

Claim 25 – Fifth independent claim

Claim 25 is directed to a polymerization process wherein one or more monomers are polymerized (para [0016], lines 1-2 of para [0051]). The one or more monomer is contacted with one or more Lewis acid(s) (para [0016]) and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) (paragraphs [0016], [0046], [00122]) in a reactor. The diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent (lines 1-2 of para [00132]). The temperature of the polymerization is less than 0°C (lines 6-7 of paragraph [00146]) and the pressure is from above 0 to 14,000 kPa (line 1 of paragraph [00148]). The one or more Lewis acid(s) is represented by the formula  $M(RC=OO)_nR'_mX_{y-(m+n)}$  (lines 1-2 of para [0071]), wherein M is a Group 15 metal (line 2 of para [0071]), each RC=OO is a monovalent C<sub>2</sub> to C<sub>30</sub> hydrocarbacyloxy radical independently selected from the group consisting of an alkacyloxy, arylacyloxy, arylalkylacyloxy, alkylarylacyloxy radicals (lines 3-4 of para [0071]), each R' is a monovalent C<sub>1</sub> to C<sub>12</sub> hydrocarbon radical independently selected from the group consisting of an alkyl, aryl, arylalkyl, alkylaryl and cycloalkyl radicals (lines 5-7 of para [0071]), n is an integer from 0 to 4 (line 7 of para [0071]), m is an integer from 0 to 4 (lines 7-8 of para [0071]), y is 3, 4 or 5, wherein the sum of n and m is less than y (line 8 of para [0071]), and each X is a halogen (line 8 of para [0071]).

Claim 28 – Sixth independent claim

Claim 28 is directed to a polymerization process wherein one or more monomers are polymerized (para [0016], lines 1-2 of para [0051]). The one or more monomer is contacted with one or more Lewis acid(s) (para [0016]) wherein the Lewis acid metal is from Groups 4, 5, 13, 14 or 15 of the Periodic Table (lines 1-3 of para [0058]), and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) (paragraphs [0016], [0046], [00122]) in a reactor. The diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent (lines 1-2 of para [00132]). The temperature of the polymerization is less than 0°C (lines 6-7 of paragraph [00146]) and the pressure is from above 0 to 14,000 kPa (line 1 of paragraph [00148]). The process further comprises one or more initiator(s) (para [0016]) independently selected from the group consisting of a hydrogen halide, a carboxylic acid, a carboxylic acid halide, a sulfonic acid, an alcohol, a phenol, a polymeric halide, a tertiary alkyl halide, a tertiary aralkyl halide, a tertiary alkyl ester, a tertiary aralkyl ester, a tertiary alkyl ether, a tertiary aralkyl ether, an alkyl halide, an aryl halide, an alkylaryl halide and an arylalkylacid halide (para [0076]).

Claim 29 – Seventh independent claim

Claim 29 is directed to a polymerization process wherein one or more monomers are polymerized (para [0016], lines 1-2 of para [0051]). The one or more monomer is contacted with one or more Lewis acid(s) (para [0016]) wherein the Lewis acid metal is from Groups 4, 5, 13, 14 or 15 of the Periodic Table (lines 1-3 of para [0058]), and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) (paragraphs [0016], [0046], [00122]) in a reactor. The diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent (lines 1-2 of para [00132]). The temperature of the polymerization is less than 0°C (lines 6-7 of paragraph [00146]) and the pressure is from above 0 to 14,000 kPa (line 1 of paragraph [00148]). The process further comprises one or more initiator(s) (para [0016]) independently selected from the group consisting of HCl (line 5 of para [0074]), H<sub>2</sub>O (line 5 of para [0074]), methanol (line 1 of para [0082]), (CH<sub>3</sub>)<sub>3</sub>CCl (line 6 of para [0074]), C<sub>6</sub>H<sub>5</sub>C(CH<sub>3</sub>)<sub>2</sub>Cl (line 6 of para [0074]), (2-Chloro-2,4,4-trimethylpentane) (line 6 of para [0074]), and 2-chloro-2-methylpropane (line 12 of para [0083]).

Claim 30 – Eight independent claim

Claim 30 is directed to polymerization process wherein one or more monomers are polymerized (para [0016], lines 1-2 of para [0051]). The one or more monomer is contacted with one or more Lewis acid(s) (para [0016]) wherein the Lewis acid metal is from Groups 4, 5, 13, 14 or 15 of the Periodic Table (lines 1-3 of para [0058]), and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) (paragraphs [0016], [0046], [00122]) in a reactor. The diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent (lines 1-2 of para [00132]). The temperature of the polymerization is less than 0°C (lines 6-7 of paragraph [00146]) and the pressure is from above 0 to 14,000 kPa (line 1 of paragraph [00148]). The process further comprises one or more initiator(s) (para [0016]) independently selected from the group consisting of hydrogen chloride, hydrogen bromide, hydrogen iodide (para [0077]), acetic acid, propanoic acid, butanoic acid; cinnamic acid, benzoic acid, 1-chloroacetic acid, dichloroacetic acid, trichloroacetic acid, trifluoroacetic acid, p-chlorobenzoic acid, p-fluorobenzoic acid (lines 2-5 of para [0078]), acetyl chloride, acetyl bromide, cinnamyl chloride, benzoyl chloride, benzoyl bromide, trichloroacetylchloride, trifluoroacetylchloride, p-fluorobenzoylchloride (lines 6-9 of para [0079]), methanesulfonic acid, trifluoromethanesulfonic acid, trichloromethanesulfonic acid, p-toluenesulfonic acid

(lines 3-4 of para [0080]), methanesulfonyl chloride, methanesulfonyl bromide, trichloromethanesulfonyl chloride, trifluoromethanesulfonyl chloride, p-toluenesulfonyl chloride (lines 7-8 of para [0081]), methanol, ethanol, propanol, 2-propanol, 2-methylpropan-2-ol, cyclohexanol, benzyl alcohol (lines 1-2 of para [0082]), phenol, 2-methylphenol, 2,6-dimethylphenol, p-chlorophenol, p-fluorophenol, 2,3,4,5,6-pentafluorophenol, and 2-hydroxynaphthalene (lines 3-4 of para [0082]).

Claim 31 – Ninth independent claim

Claim 31 is directed to a polymerization process wherein one or more monomer(s) are polymerized ((para [0016], lines 1-2 of para [0051]). The one or more monomer is contacted with one or more Lewis acid(s) (para [0016]) wherein the Lewis acid metal is from Groups 4, 5, 13, 14 or 15 of the Periodic Table (lines 1-3 of para [0058]), and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) (paragraphs [0016], [0046], [00122]) in a reactor. The diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent(lines 1-2 of para [00132]). The temperature of the polymerization is less than 0°C (lines 6-7 of paragraph [00146]) and the pressure is from above 0 to 14,000 kPa (line 1 of paragraph [00148]). The process further comprises one or more initiator(s) (para [0016]) independently selected from the group consisting of 2-chloro-2,4,4-trimethylpentane; 2-bromo-2,4,4-trimethylpentane; 2-chloro-2-methylpropane; 2-bromo-2-methylpropane; 2-chloro-2,4,4,6,6-pentamethylheptane; 2-bromo-2,4,4,6,6-pentamethylheptane; 1-chloro-1-methylethylbenzene; 1-chloroadamantane; 1-chloroethylbenzene; 1, 4-bis(1-chloro-1-methylethyl) benzene; 5-tert-butyl-1,3-bis(1-chloro-1-methylethyl) benzene; 2-acetoxy-2,4,4-trimethylpentane; 2-benzoyloxy-2,4,4-trimethylpentane; 2-acetoxy-2-methylpropane; 2-benzoyloxy-2-methylpropane; 2-acetoxy-2,4,4,6,6-pentamethylheptane; 2-benzoyl-2,4,4,6,6-pentamethylheptane; 1-acetoxy-1-methylethylbenzene; 1-acetoxyadamantane; 1-benzoyloxyethylbenzene; 1,4-bis(1-acetoxy-1-methylethyl) benzene; 5-tert-butyl-1,3-bis(1-acetoxy-1-methylethyl) benzene; 2-methoxy-2,4,4-trimethylpentane; 2-isopropoxy-2,4,4-trimethylpentane; 2-methoxy-2,4,4,6,6-pentamethylheptane; 2-isopropoxy-2,4,4,6,6-pentamethylheptane; 1-methoxy-1-methylethylbenzene; 1-methoxyadamantane; 1-methoxyethylbenzene; 1,4-bis(1-methoxy-1-methylethyl) benzene; 5-tert-butyl-1,3-bis(1-methoxy-1-methylethyl) benzene, and 1,3,5-tris(1-chloro-1-methylethyl) benzene (para [0083]).

Claim 32 – Tenth independent claim

Claim 32 is directed to a polymerization process wherein one or more monomers are polymerized (para [0016], lines 1-2 of para [0051]). The one or more monomer is contacted with one or more Lewis acid(s) (para [0016]) wherein the Lewis acid metal is from Groups 4, 5, 13, 14 or 15 of the Periodic Table (lines 1-3 of para [0058]), and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) (paragraphs [0016], [0046], [00122]) in a reactor. The diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent (lines 1-2 of para [00132]). The temperature of the polymerization is less than 0°C (lines 6-7 of paragraph [00146]) and the pressure is from above 0 to 14,000 kPa (line 1 of paragraph [00148]). The process further comprises a weakly-coordinating anion (lines 1-3 of para [0088]).

Claim 53 – Eleventh independent claim

Claim 53 is directed to a polymerization medium suitable to polymerize one or more monomer(s) to form a polymer (para [0027]). The polymerization medium comprises one or more Lewis acid(s), one or more initiator(s) and a diluent comprising one or more hydrofluorocarbon(s) (HFC) (para [0027]). The one or more Lewis acid(s) is not a compound represented by formula MX<sub>3</sub>, where M is a group 13 metal and X is a halogen (lines 5-6 of para [0027]). The diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent (lines 1-2 of para [00132]). The temperature of the polymerization is less than 0°C (lines 6-7 of paragraph [00146]) and the pressure is from above 0 to 14,000 kPa (line 1 of paragraph [00148]). The one or more initiator(s) is independently selected from the group consisting of a hydrogen halide, a carboxylic acid, a carboxylic acid halide, a sulfonic acid, an alcohol, a phenol, a polymeric halide, a tertiary alkyl halide, a tertiary aralkyl halide, a tertiary alkyl ester, a tertiary aralkyl ester, a tertiary alkyl ether, a tertiary aralkyl ether, an alkyl halide, an aryl halide, an alkylaryl halide and an arylalkylacid halide (para [0076]).

Claim 59 – Twelfth independent claim

Claim 59 is directed to a polymerization process wherein one or more monomers are polymerized (para [0016], lines 1-2 of para [0051]) to form a polymer. The one or more monomer(s) is contacted in a polymerization medium comprising one or more Lewis acid(s) (para [0016]), a weakly coordinating anion (para [0088]), and a diluent comprising one or

more hydrofluorocarbon(s) (HFC) ((paragraphs [0016], [0046], [00122])). The one or more Lewis acid(s) is not a compound represented by formula MX<sub>3</sub>, where M is a group 13 metal and X is a halogen (lines 5-6 of para [0027]). The diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent (lines 1-2 of para [00132]). The temperature of the polymerization is less than 0°C (lines 6-7 of paragraph [00146]) and the pressure is from above 0 to 14,000 kPa (line 1 of paragraph [00148]).

**VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

- A) The provisional rejection of Claims 1, 9, 10, 28, 2-7, 11-18, 20-30, 33, 35-40, 48-50, 53, and 59 under the judicially created doctrine of obviousness-type double patenting over claims 1-58 of copending US Application 11/728306.
- B) The provisional rejection of Claims 1, 9, 10, 22-25, 32, and 59 under the judicially created doctrine of obviousness-type double patenting over claims 120-161 of copending US Application 11/628608.

## VII. ARGUMENT

### A. Provisional Obviousness Double Patenting over copending US Application 11/728306

Claims 1, 9, 10, 28, 2-7, 11-18, 20-30, 32, 33, 35-40, 48-50, 53, and 59 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claims 1-58 of copending US Application 11/728306 (Attorney Docket No. 2007EM051).

In the first issuance of this rejection, in the Office Action dated November 26, 2008, it was held that while the ‘conflicting claims are not identical, they are not patentably distinct from each other because the instant claims over obvious over the copending claims.’ The rejection acknowledged that the copending claims do not recite the polymerization temperature and pressure and the HFC diluent percentage as recited in each rejected claim. It was held that such would have been obvious ‘simply by operating the copending method in accordance with the repeated explicit teachings of the disclosure.’

Appellants respectfully traverse the rejection and request the Board to consider the following arguments.

#### 1. Maintaining of Rejection Not Permissible per MPEP

Appellants object to the refusal of the Office to withdraw this rejection in light of MPEP 804.I.B.1, which has the following instructions:

If a “provisional” nonstatutory obviousness-type double patenting (ODP) rejection is the only rejection remaining in the earlier filed of the two pending applications, while the later one is rejectable on other grounds, the examiner should withdraw that rejection and permit the earlier-filed application to issue as a patent without a terminal disclaimer.

Herein, the present rejection is made in the earlier filed of the two pending application. While it is not the *only* rejection remaining, the other remaining rejection is also a provisional obviousness type double patenting rejection over a later filed application. Per the MPEP, these provisional rejections should be withdrawn and the application should be permitted to grant.

In the November 2008 Office Action, it was stated that this rejection might not be withdrawn because the copending application recites additional subject matter and an obviousness type double patenting rejection in the copending application over this

application “may not be possible”. Appellants do not see that as a hindrance to patentability of this application. The invention in the copending application is the use of the polymorphogenate. It is expected that if an examiner finds prior art teaching the use of polymorphogenates in the polymerization system recited in the copending application, an appropriate rejection shall be made. That rejection may even use this application (or the publication thereof) as a main reference in such a rejection. Not being able to make a rejection in the copending application, or no rejection having been made simply because the application has not been examined yet, fails to make this application unpatentable.

In the August 2009 Advisory Action, in response to Appellant’s arguments about the above noted MPEP section, it was stated that “this policy only applies when provisional ODP rejections exit in two applications, each over the other.” This is incorrect – the above MPEP section does *not* state that there must be rejections in each of the two applications. Appellants note that even if there was an ODP rejection in the other copending application, the next paragraph in the cited MPEP mandates that the rejection in the earlier filed application must be dropped and the earlier application allowed to grant.

In the Advisory Action it is further stated that “Since the copending application claims an additional structure, an ODP rejection has not, and probably cannot be made” over this application. As argued above, the presence of an OPD rejection, or even the ability to make an ODP rejection, in the copending application over the present application is irrelevant to the patentability of this application. Contrary to the assertion in the Advisory Action, this is not a requirement that the later filed application must be subject to an ODP rejection over the present application. MPEP 804.I.B.1 simply requires that the later filed application be “rejectable on other grounds” - meaning that the prosecution in the later filed application is not closed on the merits. As noted above, there may be relevant prior art that would support anticipation and obviousness rejections in the later filed application; only actual examination in the later filed case will provide that answer. To refuse the explicit directions of the MPEP to allow this application to grant because of unknown prosecution in a later filed improvement patent application is akin to holding this application hostage. Absent any other relevant prior art available under U.S.C. § 102 being found, the Examiner has no reason to continue to fail to progress this application to grant.

2. Contrary to the Stated Intent of the Judicially Created Doctrine

Maintaining this rejection is contrary to the stated intent of the judicially created doctrine of obviousness type double patenting. This doctrine was created to prevent the unjustified extension of a first patent term by claiming obvious variations in a second application.

In the present circumstance, the application at issue is not a “second application” but is the ‘first’ application which could result in the “first patent term”. Upon expiration of a patent that issues on the present application, others may practice what is recited in the claims of the present application. Should the present claims of the second application mature into a patent, upon expiration of a patent granted on the present application, others may still practice what is recited in the claims of the present application. They will only be estopped from practicing the recited addition of a polymorphogenate. This is not a situation that was deemed impermissible by the court that created the doctrine of obviousness double patenting.

The present situation is exactly that which was contemplated by those who established the patent system – that by the disclosure to the public via patents of base technology, there would be improvements on that base technology. To refuse to allow the base technology patent to grant out because the inventors later filed for an improvement patent over their own technology fails to promote the progress of science and is contrary to both the goals of the patent system and the judicially created doctrine of obviousness type double patenting.

3. Domination of Parent Technology over Later Discovered Improvement

Future improvements and inventions such as those disclosed in the copending later filed application should not be a bar to the patentability of the present application, which is based on what was known at the time of filing of the present application. At best, the present application dominates the copending application. Per MPEP 804.II, the present broader, earlier filed application simply “dominates” the copending later filed improvement application and domination alone does not give rise to double patenting. As recognized by the Courts, reciting a broader, generic claim, is not per se double patenting, *see in re Kaplan*, 789 F.2d 1574, 1577-1578 (CAFC 1986).

In the Advisory Action of August 17, 2009, the response to this argument is “the presence of domination does not preclude making an obviousness type double patenting.” Appellants do not disagree and under some circumstance such a *non-provisional* ODP

rejection might be appropriate. In fact, in this application, a terminal disclaimer was filed in response to a non-provisional ODP rejection made over a later filed application that had already matured into a granted patent, though the pending claims dominate over the patented claims.

A full reading of MPEP 804.B.1 cited in the Advisory Action directs the examiner to ask the following question prior to making the ODP rejection:

does any claim in the *application* define an invention that is anticipated by, or is merely an obvious variation of, an invention claimed in the *patent*?

Thus, if the other reference is a granted patent and the claims of the pending application would dominate over the claims of the already granted *patent* an obviousness type double patenting rejection is appropriate. This is the exact reason that the judicially created doctrine of obviousness type double patenting was created.

However, this is not the present situation. Herein the reference claims are present in a co-pending application that was filed later than the present application (there is a difference of over four years in the priority filing dates and just under two years difference in the 371 filing dates) wherein the applicants of the copending application are basing novelty on the use of a polymorphogenate in the catalyst system – something not known or appreciated by Appellants at the time of filing of the present application.

Prior to the section quoted by the Examiner, MPEP 804.I.B.1. (already quoted and discussed above) already address what an examiner should do if the reference claims are in a later filed application. Appellants respectfully assert that the above MPEP section quoted in the Advisory Action is not applicable when the ODP rejection is a *provisional* ODP rejection.

#### 4. Scope of Claims identified in copending Application

In the April 2009 Office Action (pg 4), it is stated that the “instant claims are broader than the copending claims (and therefore anticipated) except that the copending claims do not recite the pressure and temperature requirements of the instant claims.” Appellants disagree.

In the present provisional rejection, the claims of the instant application are rejected over all of the claims of the copending Application. Claim 1 of 11/728,306 recites:

1. A method to polymerize one or more monomer(s) to form isoolefin polymers and copolymers, comprising:  
polymerizing the one or more monomer(s) in a

polymerization medium comprising the one or more monomer(s), a diluent and a catalyst system; wherein the diluent comprises one or more halogenated hydrocarbon(s); wherein the catalyst system comprises one or more Lewis acid(s) and a plurality of modifiers comprising one or more initiator(s) and one or more polymorphogenate(s); and

adjusting the concentration of said one or more polymorphogenate(s) in said polymerization medium so than said isoolefin polymers and copolymers having a controlled MWD greater than 2.0.

As evident from a comparison of copending claim 1 of 11/728,306 (excluding the language in regards to the polymorphogenate – the admitted inventive aspect of the copending application) and the present claims, the present claims are *not* broader than the copending claims. Multiple rejected claims of the present application are specific as to the structure of the Lewis acid and are thus species to the broad recitation of “one or more Lewis acid” in the copending claim 1. All of the present claims require the use of a hydrofluorocarbon in the diluent – this is narrower than the recited “halogenated hydrocarbon(s)” of copending claim 1. Only copending claims 23 and 24 recite the use of hydrofluorocarbons. This appears to be recognized by the comment ‘particularly in view of claim 24’ made in the November 2008 Office Action. Claims 1, 22, 23, 24, 25, 28, 29, 30, 32, 53, and 59 – which all recite a narrow scope of Lewis acid and a diluent requiring HFC content – on their face fail to have a broader scope than claims 1-22, 26-42, and 56-60. Even should the Board determine that Appellants arguments with respect to maintaining the provisional rejection are incorrect, Appellants request that the proper claims applicable to the ODP rejection be identified.

##### 5. Factual Inquiry per Graham v. Deere

In the rejection, it is held that the recited polymerization temperature, polymerization pressure, and the HFC diluent percentage as recited in each rejected claim would have been obvious ‘simply by operating the copending method in accordance with the repeated explicit teachings of the disclosure.’

However, in making such rejections, the disclosure of the copending application is being used contrary to what is permissible – the disclosure cannot be used to form an obviousness rejection, *General Foods Corp. v. Studiengesellschaft Kohle mbH*, 23 USPQ2d 1839 (Fed. Cir. 1992), and MPEP 804.II.B.1. While all use of the disclosure of a copending

application is not precluded, the use of the copending disclosure is strictly limited to those portions of the disclosure which act as a dictionary to the claim terms or show an obvious variant to what is recited in the copending claims. Temperature and pressure conditions are not recited in the copending applications and thus do not need defining, nor are other conditions claimed which could possibly be obvious variants to the presently recited temperature and pressure. Thus, the use of the disclosure of the copending applications is impermissible, as duly noted in MPEP 804.II.B.1: “only the disclosure of the invention *claimed* in the patent may be examined.”

In the Advisory Action, the same MPEP section is cited and it is stated that “As the previously cited portions of the reference specifications provide support for the claimed subject matter, those section may also be examined in consideration of obviousness.”

However, the rejection ignores the further admonition given by the *Vogel* court, noted in MPEP 804.II.B.1:

According the court, one must first “determine how much of the patent disclosure pertains to the invention claimed in the patent” because only “[t]his portion of the specification supports the patent claims and may be considered.”

The ‘previously cited portions of the reference specification’ noted in the Advisory are paragraphs [0126] to [0128] of the specification. However, a review of these paragraphs shows that paragraph [0126] is a discussion of the polymerization temperature and [00127] is a discussion of the reaction pressure. As neither of these two operating parameters are recited in the claims of the copending application – these two paragraphs do not support the patent claims and may not be used to support an obviousness argument. Thus, *prima facie* obviousness has not been established.

Accordingly, Appellants respectfully request that the provisional rejection under the judicially created doctrine of obviousness type double patent over copending US 11/728,306 be withdrawn.

B. Provisional Obviousness Double Patenting over copending US Application 11/628608

Claims 1, 9, 10, 22-25, 32, and 59 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claims 120-161 of copending US Application 11/628608. Appellants respectfully traverse this rejection.

In the first issuance of this rejection, in the Office Action dated November 26, 2008, it was held that while the ‘conflicting claims are not identical, they are not patentably distinct from each other because the instant claims over obvious over the copending claims.’ The rejection acknowledged that the copending claims do not recite the polymerization temperature and pressure and the HFC diluent percentage as recited in each rejected claim. It was held that such would have been obvious ‘simply by operating the copending method in accordance with the repeated explicit teachings of the disclosure.’

Appellants respectfully traverse the rejection and request the Board to consider the following arguments.

1. Maintaining of Rejection Not Permissible per MPEP

Appellants object to the refusal of the Office to withdraw this rejection in light of MPEP 804.I.B.1, which has the following instructions:

If a “provisional” nonstatutory obviousness-type double patenting (ODP) rejection is the only rejection remaining in the earlier filed of the two pending applications, while the later one is rejectable on other grounds, the examiner should withdraw that rejection and permit the earlier-filed application to issue as a patent without a terminal disclaimer.

Herein, the present rejection is made in the earlier filed of the two pending application. While it is not the *only* rejection remaining, the other remaining rejection is also a provisional obviousness type double patenting rejection over a later filed application. Per the MPEP, these provisional rejections should be withdrawn and the application should be permitted to grant.

In the November 2008 Office Action, it was stated that this rejection might not be withdrawn because the copending application recites additional subject matter and an obviousness type double patenting rejection in the copending application over this application “may not be possible”. Appellants do not see that as a hindrance to patentability of this application. The invention in the copending application is the use of the two feed

streams with a limited contact time of the two streams. The examiner in charge of the copending application has issued a first non-final Office Action in the copending application (mailed on September 8, 2009), and has used a co-owned patent (US 7332554 to Shaffer et al) as the basis for multiple rejections. Contrary to the assertions in the November 2008 Office Action, not being able to make a rejection in the copending application fails to make this application unpatentable.

In the August 2009 Advisory Action, in response to Appellant's arguments about the above noted MPEP section, it was stated that "this policy only applies when provisional ODP rejections exit in two applications, each over the other." This is incorrect – the above MPEP section does *not* state that there must be rejections in each of the two applications. Appellants note that even if there was an ODP rejection over this application in the other copending application (which there is not), the next paragraph in the cited MPEP mandates that the ODP rejection in the earlier filed application must be dropped and the earlier application allowed to grant.

In the Advisory Action it is further stated that "Since the copending application claims an additional structure, an ODP rejection has not, and probably cannot be made" over this application. As argued above, the presence of an OPD rejection, or even the ability to make an ODP rejection, in the copending application over the present application is irrelevant to the patentability of this application. Contrary to the assertion in the Advisory Action, this is not a requirement that the later filed application must be subject to an ODP rejection over the present application. MPEP 804.I.B.1 simply requires that the later filed application be "rejectable on other grounds" - meaning that the prosecution in the later filed application is not closed on the merits. A first non-final Office Action has been issued in the copending application and the examiner in charge still has the opportunity to make any ODP rejections determined to be necessary. To refuse the explicit directions of the MPEP to allow this application to grant because no ODP rejection has been made in the later filed patent application is akin to holding this application hostage. Absent any other relevant prior art available under U.S.C. § 102 being found, the Examiner has no reason to continue to fail to progress this application to grant.

## 2. Contrary to the Stated Intent of the Judicially Created Doctrine

Maintaining this rejection is contrary to the stated intent of the judicially created doctrine of obviousness type double patenting. This doctrine was created to prevent the

unjustified extension of a first patent term by claiming obvious variations in a second application.

In the present circumstance, the application at issue is not a “second application” but is the ‘first’ application which could result in the “first patent term”. Upon expiration of a patent that issues on the present application, others may practice what is recited in the claims of the present application. Should the present claims of the second application mature into a patent, upon expiration of a patent granted on the present application, others may still practice what is recited in the claims of the present application. They will only be estopped from practicing any further patented improvements arising from a grant of the copending application. This is not a situation that was deemed impermissible by the court that created the doctrine of obviousness double patenting.

The present situation is exactly that which was contemplated by those who established the patent system – that by the disclosure to the public via patents of base technology, there would be improvements on that base technology. To refuse to allow the base technology patent to grant out because the inventors later filed for an improvement patent over their own technology fails to promote the progress of science and is contrary to both the goals of the patent system and the judicially created doctrine of obviousness type double patenting.

### 3. Domination of Parent Technology over Later Discovered Improvement

Future improvements and inventions such as those disclosed in the copending later filed application should not be a bar to the patentability of the present application, which is based on what was known at the time of filing of the present application. At best, the present application dominates the copending application. Per MPEP 804.II, the present broader, earlier filed application simply “dominates” the copending later filed improvement application and domination alone does not give rise to double patenting. As recognized by the Courts, reciting a broader, generic claim, is not per se double patenting, *see in re Kaplan*, 789 F.2d 1574, 1577-1578 (CAFC 1986).

In the Advisory Action of August 17, 2009, the response to this argument is “the presence of domination does not preclude making an obviousness type double patenting.” Appellants do not disagree and under some circumstance such a *non-provisional* ODP rejection might be appropriate. In fact, in this application, a terminal disclaimer was filed in response to a non-provisional ODP rejection made over a later filed application that had

already matured into a granted patent, though the pending claims dominate over the patented claims.

A full reading of MPEP 804.B.1 cited in the Advisory Action directs the examiner to ask the following question prior to making the ODP rejection:

does any claim in the *application* define an invention that is anticipated by, or is merely an obvious variation of, an invention claimed in the *patent*?

Thus, if the other reference is a granted patent and the claims of the pending application would dominate over the claims of the already granted *patent* an obviousness type double patenting rejection is appropriate. This is the exact reason that the judicially created doctrine of obviousness type double patenting was created.

However, this is not the present situation. Herein the reference claims are present in a co-pending application that was filed later than the present application (there is a difference of almost two years in the priority filing dates and a year and a half difference in the 371 filing dates) wherein the applicants of the copending application are basing novelty on the dual streams, limited contact time, and the microdroplets of polymerization medium – something not known or appreciated by Appellants at the time of filing of the present application.

Prior to the section quoted by the Examiner, MPEP 804.I.B.1. (already quoted and discussed above) already address what an examiner should do if the reference claims are in a later filed application. Appellants respectfully assert that the above MPEP section quoted in the Advisory Action is not applicable when the ODP rejection is a *provisional* ODP rejection.

#### 4. Scope of Claims identified in copending Application

In the April 2009 Office Action (pg 4), it is stated that the “instant claims are broader than the copending claims (and therefore anticipated) except that the copending claims do not recite the pressure and temperature requirements of the instant claims.” Appellants disagree.

In the present provisional rejection, the claims of the instant application are rejected over *all* of the claims of the copending Application. Claims 120 and 141 (the pending independent claims) of 11/628,608 recite:

120. A polymerization process comprising contacting at least one first feed stream and at least one second feed stream at a contact time of about 30 seconds or less, the

polymerization process comprising a diluent comprising one or more hydrofluorocarbon(s) (HFC) in a reactor system.

141. A polymerization process comprising contacting a catalyst system and one or monomer(s) at a contact time of about 30 seconds or less in a microdroplet of a polymerization medium, the polymerization medium comprising a diluent comprising one or more hydrofluorocarbon(s) (HFC).

As evident from a comparison of the copending independent claims of 11/628,608 and the present claims, the present claims are *not* broader than the copending claims. Multiple rejected claims of the present application are specific as to the structure of the Lewis acid and are thus species to the broad recitation of “a catalyst” in copending claim 141 or the failure to recite a catalyst in copending claim 120. Claims 1, 22, 23, 24, 25, 28, 29, 30, 32, 53, and 59 – which all recite a narrow scope of a Lewis acid catalyst – on their face fail to have a broader scope than copending claims 120-122, 124-143, and 145-161. Even should the Board determine that Appellants arguments with respect to maintaining the provisional rejection are incorrect, Appellants request that the proper claims applicable to the ODP rejection be identified.

5. Factual Inquiry per Graham v. Deere

In the rejection, it is held that the recited polymerization temperature and polymerization pressure as recited in each rejected claim would have been obvious ‘simply by operating the copending method in accordance with the repeated explicit teachings of the disclosure.’

However, in making such rejections, the disclosure of the copending application is being used contrary to what is permissible – the disclosure cannot be used to form an obviousness rejection, *General Foods Corp. v. Studiengesellschaft Kohle mbH*, 23 USPQ2d 1839 (Fed. Cir. 1992), and MPEP 804.II.B.1. While all use of the disclosure of a copending application is not precluded, the use of the copending disclosure is strictly limited to those portions of the disclosure which act as a dictionary to the claim terms or show an obvious variant to what is recited in the copending claims. Temperature and pressure conditions are not recited in the copending applications and thus do not need defining, nor are other conditions claimed which could possibly be obvious variants to the presently recited temperature and pressure. Thus, the use of the disclosure of the copending applications is

impermissible, as duly noted in MPEP 804.II.B.1: “only the disclosure of the invention *claimed* in the patent may be examined.”

In the Advisory Action, the same MPEP section is cited and it is stated that “As the previously cited portions of the reference specifications provide support for the claimed subject matter, those section may also be examined in consideration of obviousness.”

However, the rejection ignores the further admonition given by the *Vogel* court, noted in MPEP 804.II.B.1:

According the court, one must first “determine how much of the patent disclosure pertains to the invention claimed in the patent” because only “[t]his portion of the specification supports the patent claims and may be considered.”

The ‘previously cited portions of the reference specification’ noted in the Advisory are paragraph [0107] to [0109] of the specification. However, a review of these paragraphs shows that paragraphs [0107] and [0108] are a discussion of the polymerization temperature and [0109] is a discussion of the reaction pressure. As neither of these two operating parameters are recited in the claims of the copending application – these two paragraphs do not support the patent claims and may not be used to support an obviousness argument. Thus, *prima facie* obviousness has not been established.

Accordingly, Appellants respectfully request that the provisional rejection under the judicially created doctrine of obviousness type double patent over copending US 11/628,608 be withdrawn.

Appellants respectfully submit that the foregoing arguments obviate all of the Examiner's final rejections in this case. In view of this, reversal of these rejections by the Honorable Board is respectfully requested.

Respectfully submitted,

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October 7, 2009

Date

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## CLAIMS APPENDIX

1. A polymerization process comprising contacting one or more monomer(s), wherein the one or more monomer(s) is independently selected from the group consisting of olefins, alpha-olefins, disubstituted olefins, isoolefins, conjugated dienes, non-conjugated dienes, styrenics, substituted styrenics, and vinyl ethers, one or more Lewis acid(s), and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) in a reactor and wherein the diluent comprises from 15 to 100 volume % HFC based upon the total volume of diluent, the temperature of the polymerization is less than 0°C and the pressure is from above 0 to 14,000 kPa and wherein the one or more Lewis acid(s) is represented by the formula  $MR_nX_{3-n}$  ;  
wherein M is a Group 13 metal;  
each R is a monovalent C<sub>1</sub> to C<sub>12</sub> hydrocarbon radical independently selected from the group consisting of an alkyl, aryl, arylalkyl, alkylaryl and cycloalkyl radicals;  
*n* is an integer from 1 to 3; and  
each X is a halogen.
2. The process of claim 28, wherein the one or more hydrofluorocarbon(s) is represented by the formula: C<sub>x</sub>H<sub>y</sub>F<sub>z</sub> wherein x is an integer from 1 to 40 and y and z are integers of one or more.
3. The process of claim 2, wherein x is from 1 to 10.
4. The process of claim 2, wherein x is from 1 to 6.
5. The process of claim 2, wherein x is from 1 to 3.
6. The process of claim 28, wherein the one or more hydrofluorocarbon(s) is independently selected from the group consisting of fluoromethane; difluoromethane; trifluoromethane; fluoroethane; 1,1-difluoroethane; 1,2-difluoroethane; 1,1,1-trifluoroethane; 1,1,2-trifluoroethane; 1,1,1,2-tetrafluoroethane; 1,1,2,2-tetrafluoroethane; 1,1,1,2,2-pentafluoroethane; 1-fluoropropane; 2-fluoropropane; 1,1-difluoropropane; 1,2-difluoropropane; 1,3-difluoropropane; 2,2-difluoropropane; 1,1,1-trifluoropropane; 1,1,2-trifluoropropane; 1,1,3-trifluoropropane; 1,2,2-

trifluoropropane; 1,2,3-trifluoropropane; 1,1,1,2-tetrafluoropropane; 1,1,1,3-tetrafluoropropane; 1,1,2,2-tetrafluoropropane; 1,1,2,3-tetrafluoropropane; 1,1,3,3-tetrafluoropropane; 1,2,2,3-tetrafluoropropane; 1,1,1,2,2-pentafluoropropane; 1,1,1,2,3-pentafluoropropane; 1,1,1,3,3-pentafluoropropane; 1,1,2,2,3-pentafluoropropane; 1,1,2,3,3-pentafluoropropane; 1,1,1,2,2,3-hexafluoropropane; 1,1,1,2,3,3-hexafluoropropane; 1,1,1,3,3,3-hexafluoropropane; 1,1,1,2,2,3,3-heptafluoropropane; 1,1,1,2,3,3,3-heptafluoropropane; 1-fluorobutane; 2-fluorobutane; 1,1-difluorobutane; 1,2-difluorobutane; 1,3-difluorobutane; 1,4-difluorobutane; 2,2-difluorobutane; 2,3-difluorobutane; 1,1,1-trifluorobutane; 1,1,2-trifluorobutane; 1,1,3-trifluorobutane; 1,1,4-trifluorobutane; 1,2,2-trifluorobutane; 1,2,3-trifluorobutane; 1,3,3-trifluorobutane; 2,2,3-trifluorobutane; 1,1,1,2-tetrafluorobutane; 1,1,1,3-tetrafluorobutane; 1,1,1,4-tetrafluorobutane; 1,1,2,2-tetrafluorobutane; 1,1,2,3-tetrafluorobutane; 1,1,2,4-tetrafluorobutane; 1,1,3,3-tetrafluorobutane; 1,1,3,4-tetrafluorobutane; 1,1,4,4-tetrafluorobutane; 1,2,2,3-tetrafluorobutane; 1,2,2,4-tetrafluorobutane; 1,2,3,3-tetrafluorobutane; 1,2,3,4-tetrafluorobutane; 2,2,3,3-tetrafluorobutane; 1,1,1,2,2-pentafluorobutane; 1,1,1,2,3-pentafluorobutane; 1,1,1,3,4-pentafluorobutane; 1,1,1,4,4-pentafluorobutane; 1,1,2,2,3-pentafluorobutane; 1,1,2,2,4-pentafluorobutane; 1,1,2,3,3-pentafluorobutane; 1,1,2,4,4-pentafluorobutane; 1,1,3,3,4-pentafluorobutane; 1,2,2,3,3-pentafluorobutane; 1,2,2,3,4-pentafluorobutane; 1,1,1,2,2,3-hexafluorobutane; 1,1,1,2,3,4-hexafluorobutane; 1,1,1,2,2,4-hexafluorobutane; 1,1,1,2,3,3-hexafluorobutane; 1,1,1,2,3,4-hexafluorobutane; 1,1,1,2,4,4-hexafluorobutane; 1,1,1,3,3,4-hexafluorobutane; 1,1,1,3,4,4-hexafluorobutane; 1,1,1,4,4,4-hexafluorobutane; 1,1,2,2,3,3-hexafluorobutane; 1,1,2,2,3,4-hexafluorobutane; 1,1,2,2,4,4-hexafluorobutane; 1,1,2,3,3,4-hexafluorobutane; 1,1,2,3,4,4-hexafluorobutane; 1,1,2,3,3,4-heptafluorobutane; 1,1,1,2,2,3,3-heptafluorobutane; 1,1,1,2,2,4,4-heptafluorobutane; 1,1,1,2,2,3,4-heptafluorobutane; 1,1,1,2,2,4,4-heptafluorobutane; 1,1,1,2,2,3,4-octafluorobutane; 1,1,1,2,2,3,4,4-octafluorobutane; 1,1,1,2,3,3,4,4-octafluorobutane; 1,1,1,2,2,4,4,4-octafluorobutane; 1,1,1,2,3,4,4,4-octafluorobutane; 1,1,1,2,2,3,3,4,4-nonafluorobutane; 1,1,1,2,2,3,4,4,4-nonafluorobutane; 1-fluoro-2-methylpropane; 1,1-difluoro-2-methylpropane; 1,3-difluoro-2-methylpropane; 1,1,1-

trifluoro-2-methylpropane; 1,1,3-trifluoro-2-methylpropane; 1,3-difluoro-2-(fluoromethyl)propane; 1,1,1,3-tetrafluoro-2-methylpropane; 1,1,3,3-tetrafluoro-2-methylpropane; 1,1,3-trifluoro-2-(fluoromethyl)propane; 1,1,1,3,3-pentafluoro-2-methylpropane; 1,1,3,3-tetrafluoro-2-(fluoromethyl)propane; 1,1,1,3-tetrafluoro-2-(fluoromethyl)propane; fluorocyclobutane; 1,1-difluorocyclobutane; 1,2-difluorocyclobutane; 1,3-difluorocyclobutane; 1,1,2-trifluorocyclobutane; 1,1,3-trifluorocyclobutane; 1,2,3-trifluorocyclobutane; 1,1,2,2-tetrafluorocyclobutane; 1,1,1,3,3-tetrafluorocyclobutane; 1,1,2,2,3-pentafluorocyclobutane; 1,1,2,3,3-pentafluorocyclobutane; 1,1,2,2,3,3-hexafluorocyclobutane; 1,1,2,2,3,4-heptafluorocyclobutane; vinyl fluoride; 1,1-difluoroethene; 1,2-difluoroethene; 1,1,2-trifluoroethene; 1-fluoropropene, 1,1-difluoropropene; 1,2-difluoropropene; 1,3-difluoropropene; 2,3-difluoropropene; 3,3-difluoropropene; 1,1,2-trifluoropropene; 1,1,3-trifluoropropene; 1,2,3-trifluoropropene; 1,3,3-trifluoropropene; 2,3,3-trifluoropropene; 3,3,3-trifluoropropene; 1-fluoro-1-butene; 2-fluoro-1-butene; 3-fluoro-1-butene; 4-fluoro-1-butene; 1,1-difluoro-1-butene; 1,2-difluoro-1-butene; 1,3-difluoropropene; 1,4-difluoro-1-butene; 2,3-difluoro-1-butene; 2,4-difluoro-1-butene; 3,3-difluoro-1-butene; 3,4-difluoro-1-butene; 4,4-difluoro-1-butene; 1,1,2-trifluoro-1-butene; 1,1,3-trifluoro-1-butene; 1,1,4-trifluoro-1-butene; 1,2,3-trifluoro-1-butene; 1,2,4-trifluoro-1-butene; 1,3,3-trifluoro-1-butene; 1,3,4-trifluoro-1-butene; 1,4,4-trifluoro-1-butene; 2,3,3-trifluoro-1-butene; 2,3,4-trifluoro-1-butene; 2,4,4-trifluoro-1-butene; 3,3,4-trifluoro-1-butene; 3,4,4-trifluoro-1-butene; 4,4,4-trifluoro-1-butene; 1,1,2,3-tetrafluoro-1-butene; 1,1,2,4-tetrafluoro-1-butene; 1,1,3,3-tetrafluoro-1-butene; 1,1,3,4-tetrafluoro-1-butene; 1,1,4,4-tetrafluoro-1-butene; 1,2,3,3-tetrafluoro-1-butene; 1,2,3,4-tetrafluoro-1-butene; 1,2,4,4-tetrafluoro-1-butene; 1,3,3,4-tetrafluoro-1-butene; 1,3,4,4-tetrafluoro-1-butene; 1,4,4,4-tetrafluoro-1-butene; 2,3,3,4-tetrafluoro-1-butene; 2,3,4,4-tetrafluoro-1-butene; 2,4,4,4-tetrafluoro-1-butene; 3,3,4,4-tetrafluoro-1-butene; 3,4,4,4-tetrafluoro-1-butene; 1,1,2,3,3-pentafluoro-1-butene; 1,1,2,4,4-pentafluoro-1-butene; 1,1,3,3,4-pentafluoro-1-butene; 1,1,3,4,4-pentafluoro-1-butene; 1,1,4,4,4-pentafluoro-1-butene; 1,2,3,3,4-pentafluoro-1-butene; 1,2,3,4,4-pentafluoro-1-butene; 1,2,4,4,4-pentafluoro-1-butene; 2,3,3,4,4-pentafluoro-1-butene; 2,3,4,4,4-pentafluoro-1-butene; 3,3,4,4,4-pentafluoro-1-butene; 1,1,2,3,3,4-hexafluoro-1-butene; 1,1,2,3,4,4-

hexafluoro-1-butene; 1,1,2,4,4,4-hexafluoro-1-butene; 1,2,3,3,4,4-hexafluoro-1-butene; 1,2,3,4,4,4-hexafluoro-1-butene; 2,3,3,4,4,4-hexafluoro-1-butene; 1,1,2,3,3,4,4-heptafluoro-1-butene; 1,1,2,3,4,4,4-heptafluoro-1-butene; 1,1,3,3,4,4,4-heptafluoro-1-butene; 1,2,3,3,4,4,4-heptafluoro-1-butene; 1-fluoro-2-butene; 2-fluoro-2-butene; 1,1-difluoro-2-butene; 1,2-difluoro-2-butene; 1,3-difluoro-2-butene; 1,4-difluoro-2-butene; 2,3-difluoro-2-butene; 1,1,1-trifluoro-2-butene; 1,1,2-trifluoro-2-butene; 1,1,3-trifluoro-2-butene; 1,1,4-trifluoro-2-butene; 1,2,3-trifluoro-2-butene; 1,2,4-trifluoro-2-butene; 1,1,1,2-tetrafluoro-2-butene; 1,1,1,3-tetrafluoro-2-butene; 1,1,1,4-tetrafluoro-2-butene; 1,1,2,3-tetrafluoro-2-butene; 1,1,2,4-tetrafluoro-2-butene; 1,2,3,4-tetrafluoro-2-butene; 1,1,1,2,3-pentafluoro-2-butene; 1,1,1,2,4-pentafluoro-2-butene; 1,1,1,3,4-pentafluoro-2-butene; 1,1,1,4,4-pentafluoro-2-butene; 1,1,2,3,4-pentafluoro-2-butene; 1,1,2,4,4-pentafluoro-2-butene; 1,1,1,2,3,4-hexafluoro-2-butene; 1,1,1,3,4,4-hexafluoro-2-butene; 1,1,1,4,4,4-hexafluoro-2-butene; 1,1,2,3,4,4-hexafluoro-2-butene; 1,1,1,2,4,4-heptafluoro-2-butene; 1,1,1,2,4,4,4-heptafluoro-2-butene; and mixtures thereof.

7. The process of claim 28, wherein the one or more hydrofluorocarbon(s) is independently selected from the group consisting of fluoromethane, difluoromethane, trifluoromethane, 1,1-difluoroethane, 1,1,1-trifluoroethane, 1,1,1,2-tetrafluoroethane, and mixtures thereof.
8. (Canceled)
9. The process of claim 1, wherein the diluent comprises from 20 to 100 volume % HFC based upon the total volume of the diluent.
10. The process of claim 1, wherein the diluent comprises from 25 to 100 volume % HFC based upon the total volume of the diluent.
11. The process of claim 28, wherein the diluent further comprises a hydrocarbon, a non-reactive olefin, and/or an inert gas.

12. The process of claim 28, wherein the diluent further comprises a halogenated hydrocarbon other than an HFC.
13. The process of claim 28, wherein the diluent further comprises methyl chloride.
14. The process of claim 28, wherein the one or more Lewis acid(s) is represented by the formula  $MX_4$ ;  
wherein M is a Group 4, 5, or 14 metal; and  
each X is a halogen.
15. The process of claim 28, wherein the one or more Lewis acid(s) is represented by the formula  $MR_nX_{4-n}$ ;  
wherein M is Group 4, 5, or 14 metal;  
each R is a monovalent C<sub>1</sub> to C<sub>12</sub> hydrocarbon radical independently selected from the group consisting of an alkyl, aryl, arylalkyl, alkylaryl and cycloalkyl radicals;  
 $n$  is an integer from 0 to 4; and  
each X is a halogen.
16. The process of claim 28, wherein the one or more Lewis acid(s) is represented by the formula  $M(RO)_nR'_mX_{4-(m+n)}$ ;  
wherein M is Group 4, 5, or 14 metal;  
each RO is a monovalent C<sub>1</sub> to C<sub>30</sub> hydrocarboxy radical independently selected from the group consisting of an alkoxy, aryloxy, arylalkoxy, alkylaryloxy radicals;  
each R' is a monovalent C<sub>1</sub> to C<sub>12</sub> hydrocarbon radical independently selected from the group consisting of an alkyl, aryl, arylalkyl, alkylaryl and cycloalkyl radicals;  
 $n$  is an integer from 0 to 4;  
 $m$  is an integer from 0 to 4, wherein the sum of  $n$  and  $m$  is not more than 4; and  
each X is a halogen.
17. The process of claim 28, wherein the one or more Lewis acid(s) is represented by the formula  $M(RC=OO)_nR'_mX_{4-(m+n)}$ ;  
wherein M is Group 4, 5, or 14 metal;

each  $\text{RC=OO}$  is a monovalent  $\text{C}_2$  to  $\text{C}_{30}$  hydrocarbacyl radical independently selected from the group consisting of an alkacyloxy, arylacyloxy, arylalkylacyloxy, alkylarylcloxy radicals;

each  $\text{R}'$  is a monovalent  $\text{C}_1$  to  $\text{C}_{12}$  hydrocarbon radical independently selected from the group consisting of an alkyl, aryl, arylalkyl, alkylaryl and cycloalkyl radicals;

$n$  is an integer from 0 to 4;

$m$  is an integer from 0 to 4, wherein the sum of  $n$  and  $m$  is not more than 4; and

each X is a halogen.

18. The process of claim 28, wherein the one or more Lewis acid(s) is represented by the formula  $\text{MOX}_3$ ;  
wherein M is a Group 5 metal; and  
each X is a halogen.
19. (Canceled)
20. The process of claim 28, wherein the one or more Lewis acid(s) is represented by the formula  $\text{M}(\text{RO})_n\text{R}'_m\text{X}_{3-(m+n)}$ ;  
wherein M is a Group 13 metal;  
each RO is a monovalent  $\text{C}_1$  to  $\text{C}_{30}$  hydrocarboxy radical independently selected from the group consisting of an alkoxy, aryloxy, arylalkoxy, alkylaryloxy radicals;  
each  $\text{R}'$  is a monovalent  $\text{C}_1$  to  $\text{C}_{12}$  hydrocarbon radical independently selected from the group consisting of an alkyl, aryl, arylalkyl, alkylaryl and cycloalkyl radicals;  
 $n$  is an integer from 0 to 3;  
 $m$  is an integer from 0 to 3, wherein the sum of  $n$  and  $m$  is from 1 to 3; and  
each X is a halogen.
21. The process of claim 28, wherein the one or more Lewis acid(s) is represented by the formula  $\text{M}(\text{RC=OO})_n\text{R}'_m\text{X}_{3-(m+n)}$ ;  
wherein M is a Group 13 metal;  
each  $\text{RC=OO}$  is a monovalent  $\text{C}_2$  to  $\text{C}_{30}$  hydrocarbacyl radical independently selected from the group consisting of an alkacyloxy, arylacyloxy, arylalkylacyloxy, alkylarylcloxy radicals;

- each R' is a monovalent C<sub>1</sub> to C<sub>12</sub> hydrocarbon radical independently selected from the group consisting of an alkyl, aryl, arylalkyl, alkylaryl and cycloalkyl radicals;
- n is an integer from 0 to 3;
- m is an integer from 0 to 3, wherein the sum of n and m is from 1 to 3; and
- each X is a halogen.
22. A polymerization process comprising contacting one or more monomer(s), one or more Lewis acid(s), and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) in a reactor and wherein the diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent, the temperature of the polymerization is less than 0°C and the pressure is from above 0 to 14,000 kPa and wherein the one or more Lewis acid(s) is represented by the formula MX<sub>y</sub>;
- wherein M is a Group 15 metal;
- each X is a halogen; and
- y is 3, 4 or 5.
23. A polymerization process comprising contacting one or more monomer(s), one or more Lewis acid(s), and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) in a reactor and wherein the diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent, the temperature of the polymerization is less than 0°C and the pressure is from above 0 to 14,000 kPa and wherein the one or more Lewis acid(s) is represented by the formula MR<sub>n</sub>X<sub>y-n</sub>;
- wherein M is a Group 15 metal;
- each R is a monovalent C<sub>1</sub> to C<sub>12</sub> hydrocarbon radical independently selected from the group consisting of an alkyl, aryl, arylalkyl, alkylaryl and cycloalkyl radicals;
- n is an integer from 0 to 4;
- y is 3, 4 or 5, wherein n is less than y; and
- each X is a halogen.
24. A polymerization process comprising contacting one or more monomer(s), one or more Lewis acid(s), and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) in a reactor and wherein the diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent, the temperature of the polymerization is less

than 0°C and the pressure is from above 0 to 14,000 kPa and wherein the one or more Lewis acid(s) is represented by the formula  $M(RO)_nR'_mX_{y-(m+n)}$ ;  
wherein M is a Group 15 metal,  
each RO is a monovalent C<sub>1</sub> to C<sub>30</sub> hydrocarboxy radical independently selected from the group consisting of an alkoxy, aryloxy, arylalkoxy, alkylaryloxy radicals;  
each R' is a monovalent C<sub>1</sub> to C<sub>12</sub> hydrocarbon radical independently selected from the group consisting of an alkyl, aryl, arylalkyl, alkylaryl and cycloalkyl radicals;  
*n* is an integer from 0 to 4;  
*m* is an integer from 0 to 4;  
*y* is 3, 4 or 5, wherein the sum of *n* and *m* is less than *y*; and  
each X is a halogen.

25. A polymerization process comprising contacting one or more monomer(s), one or more Lewis acid(s), and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) in a reactor and wherein the diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent, the temperature of the polymerization is less than 0°C and the pressure is from above 0 to 14,000 kPa and wherein the one or more Lewis acid(s) is represented by the formula  $M(RC=OO)_nR'_mX_{y-(m+n)}$ ;  
wherein M is a Group 15 metal;  
each RC=OO is a monovalent C<sub>2</sub> to C<sub>30</sub> hydrocarbacyloxy radical independently selected from the group consisting of an alkacyloxy, arylacyloxy, arylalkylacyloxy, alkylarylacyloxy radicals;  
each R' is a monovalent C<sub>1</sub> to C<sub>12</sub> hydrocarbon radical independently selected from the group consisting of an alkyl, aryl, arylalkyl, alkylaryl and cycloalkyl radicals;  
*n* is an integer from 0 to 4;  
*m* is an integer from 0 to 4;  
*y* is 3, 4 or 5, wherein the sum of *n* and *m* is less than *y*; and  
each X is a halogen.
26. The process of claim 28, wherein the one or more Lewis acid(s) is independently selected from the group consisting of titanium tetrachloride, titanium tetrabromide, vanadium tetrachloride, tin tetrachloride, zirconium tetrachloride, titanium bromide trichloride, titanium dibromide dichloride, vanadium bromide trichloride, tin chloride

trifluoride, benzyltitanium trichloride, dibenzyltitanium dichloride, benzylzirconium trichloride, dibenzylzirconium dibromide, methyltitanium trichloride, dimethyltitanium difluoride, dimethyltin dichloride, phenylvanadium trichloride, methoxytitanium trichloride, n-butoxytitanium trichloride, di(isopropoxy)titanium dichloride, phenoxytitanium tribromide, phenylmethoxyzirconium trifluoride, methyl methoxytitanium dichloride, methyl methoxytin dichloride, benzyl isopropoxyvanadium dichloride, acetoxytitanium trichloride, benzoylzirconium tribromide, benzyloxytitanium trifluoride, isopropoxytin trichloride, methyl acetoxytitanium dichloride, benzyl benzyloxyvanadium chloride, vanadium oxytrichloride, ethylaluminum dichloride, methylaluminum dichloride, benzylaluminum dichloride, isobutylgallium dichloride, diethylaluminum chloride, dimethylaluminum chloride, ethylaluminum sesquichloride, methylaluminum sesquichloride, trimethylaluminum, triethylaluminum, methoxyaluminum dichloride, ethoxyaluminum dichloride, 2,6-di-tert-butylphenoxyaluminum dichloride, methoxy methylaluminum chloride, 2,6-di-tert-butylphenoxy methylaluminum chloride, isopropoxygallium dichloride, phenoxy methylindium fluoride, acetoxyaluminum dichloride, benzyloxyaluminum dibromide, benzyloxygallium difluoride, methyl acetoxyaluminum chloride, isopropoxyindium trichloride, antimony hexachloride, antimony hexafluoride, arsenic pentafluoride, antimony chloride pentafluoride, arsenic trifluoride, bismuth trichloride arsenic fluoride tetrachloride, tetraphenylantimony chloride, triphenylantimony dichloride, tetrachloromethoxyantimony, dimethoxytrichloroantimony, dichloromethoxyarsine, chlorodimethoxyarsine, difluoromethoxyarsine, acetatotetrachloroantimony, (benzoato) tetrachloroantimony, and bismuth acetate chloride.

27. The process of claim 28, wherein the one or more Lewis acid(s) is independently selected from the group consisting of ethylaluminum dichloride, ethylaluminum sesquichloride, diethylaluminum chloride, methylaluminum dichloride, methylaluminum sesquichloride, dimethylaluminum chloride, and titanium tetrachloride.
28. A polymerization process comprising contacting one or more monomer(s), one or more Lewis acid(s) wherein the Lewis acid metal is from Groups 4, 5, 13, 14 or 15 of

the Periodic Table, and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) in a reactor and wherein the diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent, the temperature of the polymerization is less than 0°C and the pressure is from above 0 to 14,000 kPa and wherein the process further comprises one or more initiator(s) independently selected from the group consisting of a hydrogen halide, a carboxylic acid, a carboxylic acid halide, a sulfonic acid, an alcohol, a phenol, a polymeric halide, a tertiary alkyl halide, a tertiary aralkyl halide, a tertiary alkyl ester, a tertiary aralkyl ester, a tertiary alkyl ether, a tertiary aralkyl ether, an alkyl halide, an aryl halide, an alkylaryl halide and an arylalkylacid halide.

29. A polymerization process comprising contacting one or more monomer(s), one or more Lewis acid(s) wherein the Lewis acid metal is from Groups 4, 5, 13, 14 or 15 of the Periodic Table, and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) in a reactor and wherein the diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent, the temperature of the polymerization is less than 0°C and the pressure is from above 0 to 14,000 kPa and wherein the process further comprises one or more initiator(s) independently selected from the group consisting of HCl, H<sub>2</sub>O, methanol, (CH<sub>3</sub>)<sub>3</sub>CCl, C<sub>6</sub>H<sub>5</sub>C(CH<sub>3</sub>)<sub>2</sub>Cl, (2-Chloro-2,4,4-trimethylpentane) and 2-chloro-2-methylpropane.
30. A polymerization process comprising contacting one or more monomer(s), one or more Lewis acid(s) wherein the Lewis acid metal is from Groups 4, 5, 13, 14 or 15 of the Periodic Table, and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) in a reactor and wherein the diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent, the temperature of the polymerization is less than 0°C and the pressure is from above 0 to 14,000 kPa and wherein the process further comprises one or more initiator(s) independently selected from the group consisting of hydrogen chloride, hydrogen bromide, hydrogen iodide, acetic acid, propanoic acid, butanoic acid; cinnamic acid, benzoic acid, 1-chloroacetic acid, dichloroacetic acid, trichloroacetic acid, trifluoroacetic acid, p-chlorobenzoic acid, p-fluorobenzoic acid, acetyl chloride, acetyl bromide, cinnamyl chloride, benzoyl chloride, benzoyl bromide, trichloroacetylchloride, trifluoroacetylchloride, p-

fluorobenzoylchloride, methanesulfonic acid, trifluoromethanesulfonic acid, trichloromethanesulfonic acid, p-toluenesulfonic acid, methanesulfonyl chloride, methanesulfonyl bromide, trichloromethanesulfonyl chloride, trifluoromethanesulfonyl chloride, p-toluenesulfonyl chloride, methanol, ethanol, propanol, 2-propanol, 2-methylpropan-2-ol, cyclohexanol, benzyl alcohol, phenol, 2-methylphenol, 2,6-dimethylphenol, p-chlorophenol, p-fluorophenol, 2,3,4,5,6-pentafluorophenol, and 2-hydroxynaphthalene.

31. A polymerization process comprising contacting one or more monomer(s), one or more Lewis acid(s) wherein the Lewis acid metal is from Groups 4, 5, 13, 14 or 15 of the Periodic Table, and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) in a reactor and wherein the diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent, the temperature of the polymerization is less than 0°C and the pressure is from above 0 to 14,000 kPa and wherein the process further comprises one or more initiator(s) independently selected from the group consisting of 2-chloro-2,4,4-trimethylpentane; 2-bromo-2,4,4-trimethylpentane; 2-chloro-2-methylpropane; 2-bromo-2-methylpropane; 2-chloro-2,4,4,6,6-pentamethylheptane; 2-bromo-2,4,4,6,6-pentamethylheptane; 1-chloro-1-methylethylbenzene; 1-chloroadamantane; 1-chloroethylbenzene; 1, 4-bis(1-chloro-1-methylethyl) benzene; 5-tert-butyl-1,3-bis(1-chloro-1-methylethyl) benzene; 2-acetoxy-2,4,4-trimethylpentane; 2-benzoyloxy-2,4,4-trimethylpentane; 2-acetoxy-2-methylpropane; 2-benzoyloxy-2-methylpropane; 2-acetoxy-2,4,4,6,6-pentamethylheptane; 2-benzoyl-2,4,4,6,6-pentamethylheptane; 1-acetoxy-1-methylethylbenzene; 1-aceotxyadamantane; 1-benzoyloxyethylbenzene; 1,4-bis(1-acetoxy-1-methylethyl) benzene; 5-tert-butyl-1,3-bis(1-acetoxy-1-methylethyl) benzene; 2-methoxy-2,4,4-trimethylpentane; 2-isopropoxy-2,4,4-trimethylpentane; 2-methoxy-2-methylpropane; 2-benzylloxy-2-methylpropane; 2-methoxy-2,4,4,6,6-pentamethylheptane; 2-isopropoxy-2,4,4,6,6-pentamethylheptane; 1-methoxy-1-methylethylbenzene; 1-methoxyadamantane; 1-methoxyethylbenzene; 1,4-bis(1-methoxy-1-methylethyl) benzene; 5-tert-butyl-1,3-bis(1-methoxy-1-methylethyl) benzene, and 1,3,5-tris(1-chloro-1-methylethyl) benzene.

32. A polymerization process comprising contacting one or more monomer(s), one or more Lewis acid(s) wherein the Lewis acid metal is from Groups 4, 5, 13, 14 or 15 of the Periodic Table, and a diluent comprising one or more hydrofluorocarbon(s) (HFC's) in a reactor and wherein the diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent, the temperature of the polymerization is less than 0°C and the pressure is from above 0 to 14,000 kPa and wherein the process further comprises a weakly-coordinating anion.
33. The process of claim 28, wherein the process is substantially absent of water.
34. The process of claim 28, wherein the one or more initiator(s) comprise greater than 30 ppm water (based upon weight).
35. The process of claim 28, wherein the one or more monomer(s) is independently selected from the group consisting of olefins, alpha-olefins, disubstituted olefins, isoolefins, conjugated dienes, non-conjugated dienes, styrenics, substituted styrenics, and vinyl ethers.
36. The process of claim 28, wherein the one or more monomer(s) is independently selected from the group consisting of styrene, para-alkylstyrene, para-methylstyrene, alpha-methyl styrene, divinylbenzene, diisopropenylbenzene, isobutylene, 2-methyl-1-butene, 3-methyl-1-butene, 2-methyl-2-pentene, isoprene, butadiene, 2,3-dimethyl-1,3-butadiene, β-pinene, myrcene, 6,6-dimethyl-fulvene, hexadiene, cyclopentadiene, methyl cyclopentadiene, piperylene, methyl vinyl ether, ethyl vinyl ether, and isobutyl vinyl ether.
37. The process of claim 28, wherein the reactor is independently selected from the group consisting of a continuous flow stirred tank reactor, a plug flow reactor, a moving belt or drum reactor, a jet or nozzle reactor, a tubular reactor, a batch reactor, and an autorefrigerated boiling-pool reactor.
38. The process of claim 28 wherein the diluent has a dielectric constant greater than 10 at -85°C.

39. The process of claim 38, wherein the dielectric constant is greater than 20 at -85°C.
40. The process of claim 39, wherein the dielectric constant is greater than 25 at -85°C.
41. The process of claim 40, wherein the dielectric constant is greater than 40 at -85°C.
42. The process of claim 28, wherein the process forms a polymer having a diluent mass uptake of less than 4 wt%.
43. The process of claim 42, wherein the polymer has a diluent mass uptake of less than 3 wt%.
44. The process of claim 43, wherein the polymer has a diluent mass uptake of less than 2 wt%.
45. The process of claim 44, wherein the polymer has a diluent mass uptake of less than 1 wt%.
46. The process of claim 45, wherein the polymer has a diluent mass uptake of less than 0.5 wt%.
47. The polymerization process of claim 28, the diluent comprising methyl chloride and one or more hydrofluorocarbon(s) independently selected from the group consisting of difluoromethane, 1,1-difluoroethane, and 1,1,1,2-tetrafluoroethane in a reactor.
48. The process of claim 47, wherein the diluent further comprises a non-reactive olefin, and/or an inert gas.
49. The polymerization process of claim 28, the process comprising the steps of: reacting the one or more monomer(s) in the presence of one or more Lewis acid(s), one or more initiator(s), and a diluent comprising one or more hydrofluorocarbon(s) (HFC's); and

withdrawing the polymer from the reactor.

50. The polymerization process of claim 28, the process comprising the steps of:
  - (a) introducing one or more monomer(s) into a reactor;
  - (b) adding one or more Lewis acid(s) and one or more initiator(s);
  - (c) introducing a diluent comprising one or more hydrofluorocarbon(s) (HFC's);  
and
  - (d) withdrawing a polymer from the reactor.
51. The polymerization process of claim 28 in which particles of polymer are produced in a slurry using a catalyst system and a diluent comprising one or more hydrofluorocarbon(s) (HFC's).
52. (Canceled)
53. A polymerization medium suitable to polymerize one or more monomer(s) to form a polymer, the polymerization medium comprising one or more Lewis acid(s), one or more initiator(s) and a diluent comprising one or more hydrofluorocarbon(s) (HFC); wherein the one or more Lewis acid(s) is not a compound represented by formula  $MX_3$ , where M is a group 13 metal and X is a halogen, wherein the diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent, the temperature of the polymerization medium is less than 0°C and the pressure is from above 0 to 14,000 kPa, and wherein the one or more initiator(s) is independently selected from the group consisting of a hydrogen halide, a carboxylic acid, a carboxylic acid halide, a sulfonic acid, an alcohol, a phenol, a polymeric halide, a tertiary alkyl halide, a tertiary aralkyl halide, a tertiary alkyl ester, a tertiary aralkyl ester, a tertiary alkyl ether, a tertiary aralkyl ether, an alkyl halide, an aryl halide, an alkylaryl halide and an arylalkylacid halide.
54. – 58. (Canceled)
59. A process to polymerize one or more monomer(s) to form a polymer, comprising contacting one or more monomer(s) in a polymerization medium comprising one or

more Lewis acid(s), a weakly coordinating anion, and a diluent comprising one or more hydrofluorocarbon(s) (HFC); wherein the one or more Lewis acid(s) is not a compound represented by formula  $\text{MX}_3$ , where M is a group 13 metal and X is a halogen, wherein the diluent comprises from 5 to 100 volume % HFC based upon the total volume of diluent, the temperature of the polymerization is less than 0°C and the pressure is from above 0 to 14,000 kPa.

**EVIDENCE APPENDIX**

No evidence presented.

**RELATED PROCEEDINGS APPENDIX**

There are no related proceedings.